Health Technical Memorandum 2011

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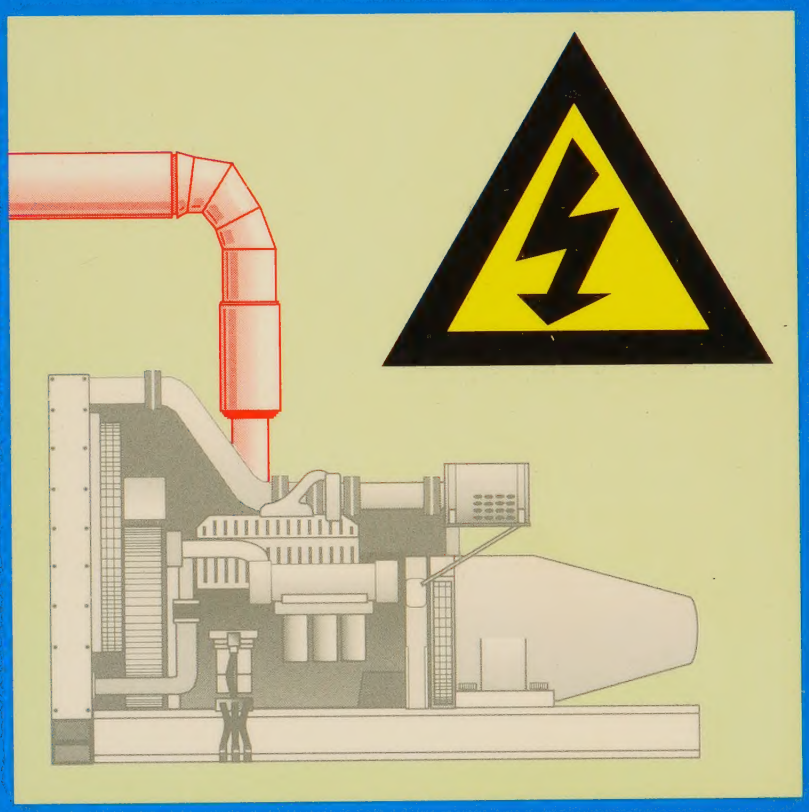
Management policy

Emergency electrical services



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An Executive Agency of the Department of Health

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Health Technical Memorandum 2011

Management policy

Emergency electrical services

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About this publication

Health Technical Memoranda (HTM) give comprehensive advice and guidance on the design, installation and operation of specialised building and engineering technology used in the delivery of health care.

They are applicable to new and existing sites, and are for use at various stages during the inception, design, construction, refurbishment and maintenance of a building.

Health Technical Memorandum 2011

HTM 2011 focuses on the:

- legal and mandatory requirements;
- design applications;
- maintenance; and
- operation,

of emergency and essential electrical supply equipment in all types of health care and personal social services premises.

It is published as four separate volumes each addressing a specialist discipline:

- This volume – **Management policy** – outlines the overall responsibility of managers of health care and personal social services premises, and details their legal and mandatory obligations in setting up and operating a reliable emergency electrical supply. It summarises the technical aspects involved and concludes with a list of definitions;
- **Design considerations** – highlights the overall requirements and considerations that should be applied to the design up to the contract document;
- **Validation and verification** – details the requirements for ensuring that manufactured equipment is formally tested and certified as to contract and manufactured to the highest level of quality assurance. The importance of commissioning is

emphasised and the order of tests on site is listed. Routine testing, which is a subset of these commissioning tests, is also reviewed;

- **Operational management** – provides information for those responsible for overseeing and operating day-to-day running and maintenance. Coverage includes stand-by generators, batteries, test runs and record keeping. Supplementary power for peak periods, and combined heat and power systems are also discussed.

Guidance in this Health Technical Memorandum is complemented by the library of National Health Service Model Engineering Specifications. Users of the guidance are advised to refer to the relevant specifications for "Emergency supply".

The contents of this Health Technical Memorandum in terms of management policy, operational policy and technical guidance are endorsed by:

- The Welsh Office for the NHS in Wales;
- The Health and Personal Social Services Management Executive in Northern Ireland;
- The National Health Service in Scotland Management Executive,

and set the required standards consistent with Departmental Cost Allowances.

References to legislation appearing in the main text of this guidance apply in England and Wales. Where references differ for Scotland and/or Northern Ireland these are given as marginal notes.

Where appropriate, marginal notes are also used to amplify the text.

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1.0 Scope

General

1.1 Health care and personal social services premises are totally dependent upon electrical power supplies, not only to maintain a safer and more comfortable environment for patients and staff, but also to give greater scope for treatment using sophisticated medical equipment at all levels of clinical and surgical care. Changes in application, design and statutory requirements have led to the introduction of a new generation of equipment and new standards of reliability.

1.2 Interruptions in electrical power supplies to equipment can seriously disrupt the delivery of health care with serious consequences for patient well-being. Health care and personal social services premises must therefore ensure that they can continue to provide electrical power to essential services in the event of prolonged or short disruption to supplies.

Emergency electrical services

1.3 Emergency electrical services form an integral part of the health care and personal social services premises supply network in meeting both safety and functional requirements. They can be in the form of batteries, uninterrupted power supply (UPS) systems, or stand-by generators.

1.4 The provision of emergency electrical services in health care and personal social services premises is a management responsibility at both new and existing sites. This guidance is equally applicable to premises which offer acute health care services under the Registered Homes Act 1984.

Nursing Homes and Agencies Act (Northern Ireland) 1971
Nursing Homes Regulations (Northern Ireland) 1974
Registered Establishments (Scotland) Act 1987

2.0 Management responsibilities

Statutory requirements

2.1 It is the responsibility of general managers/chief executives to ensure that their premises comply with all statutes.

2.2 Managers (owners or occupiers) of health care and personal social services premises (the latter are premises registered on behalf of the Secretary of State under the Registered Homes Act 1984) have an overriding general duty of care under the Health and Safety Act 1974.

2.3 Essential supplies and manufactured equipment must comply with the following legislation in total or in part as applicable:

a. Electricity Act, 1989[1];

b. Electricity Supply Regulations, 1988 (as amended 1990)[2];

c. Electricity at Work Regulations, 1989[3];

d. Health and Safety at Work Act, 1974;

e. Clean Air Act, 1956[4];

f. Health and Safety Executive Document "Occupational Exposure Limits" (OEL), "Annual Guidance Note EH/40/1992" (This document is updated annually);

g. Control of Substances Hazardous to Health Regulations (COSHH), 1988[5];

h. Energy Act, 1983[6];

j. Safety Signs Regulations, 1980[7];

k. G59/1: Recommendations for Embedded Generator Plant connected to Regional Electricity Company Supplies (Electricity Association);

m. Report ET 113 (1989) Protection of private generating sets up to 5MW for operation in parallel with Electricity Boards' distribution networks (Electricity Association).

Nursing Homes and Agencies Act (Northern Ireland) 1971
Nursing Homes Regulations (Northern Ireland) 1974
Health and Safety at Work (Northern Ireland) Order 1978 SI 1979/1039 NI 9
Registered Establishments (Scotland) Act 1987
1. Electricity (Northern Ireland) Requirements Order 1991
2. Electricity Supply Regulations (Northern Ireland), SI 1991/536 (NI)
3. Electricity at Work Regulations (Northern Ireland), 1991, (SR 191/13) Enforcement date 6 January 1992
4. Clean Air (Northern Ireland) Order 1981, SI 1981/158 NI4
5. Control of Substances Hazardous to Health Regulations (Northern Ireland) 1990 (SR 1990/374)
6. Electricity (Northern Ireland) Order 1991
7. Safety Signs Regulations (Northern Ireland), SR 1981 No 352

Other obligations

2.4 Managers have broader obligations to ensure that essential electrical supply services are maintained in the form of both generated and no-break supplies during any short or long term interruptions in the normal supply.

Functional requirements

2.5 As a guide to managers, the following table gives a brief indication of the duty imposed on various emergency/non-emergency electrical supplies that are encountered within health care and personal social services premises. These examples are not exhaustive.

Type of supply	Typical response time	Safety category	
		Statutory	Functional
Uninterruptible power supply (UPS)	No break		Computers
Batteries	Less than 0.5 sec	Escape route lighting, fire alarms	Theatre lights
Emergency Generator (Reciprocating engine)	15 sec		Clinical and diagnostic areas
Generator (non-emergency, for example, gas turbine used for combined heat and power)	Over 15 sec (for example, 3+ minutes)		Non-clinical areas

2.6 The essential characteristics of emergency standby generating sets are that they should be self contained, have their own fuel supply and be able to run independently of any other system.

2.7 Managers should ensure that all emergency generating sets are designed and rated to provide continuous full-load running for prolonged periods (minimum 200 hours). Their rating should be sufficient to provide power for essential functions. To fulfil the function of "Emergency" stand-by, an adequate supply of fuel, for example diesel, must be stored on site. Storage is required for continuous operation of the generator for a **minimum** of 200 hours, as dictated by location and fuel delivery constraints. As and when required, adequate emergency stand-by must be available at all times. This will dictate the number of sets installed to cover down time for planned maintenance. If only one generating set is provided, management has to schedule their reliance on emergency cover during the period of planned maintenance of this set.

2.8 It is recommended that managers of all health care and personal social services premises make emergency arrangements for generators of suitable power to be obtained elsewhere at short notice to supplement existing sources. Suitably rated switchgear that can be safely connected to temporary emergency generators should be identified within the essential services system of the health care and personal social services premises.

Operational management

2.9 Managers should ensure that an operational plan is in place for each site under their control. This should comprise:

a. a list and description of the main emergency plant and electrical equipment;

b. identification of qualified personnel with adequate training (see paragraph 2.10) "Designated staff functions";

c. instructions to start, operate, control and shut down the emergency generating plant and associated switching devices;

d. a schedule of possible emergency incidents, with remedial operational procedures, which may cause a loss of normal electrical supplies;

e. contingency plans for alternative generating plant (see paragraph 2.5). It is recommended that an emergency exercise, independently adjudicated, should be arranged twice a year;

f. a routine of staff training should be implemented for the basic operational procedures required during an emergency.

Designated staff functions

2.10 Only trained authorised and competent persons should be appointed by management to control the operation of emergency equipment.

2.11 Management – the owner, occupier, employer, general manager, chief executive or other person who is accountable for the premises and is responsible for issuing or implementing a general policy statement under the HSW Act 1974.

2.12 Designated person – an individual who has overall authority and responsibility for the premises containing the High/Low Voltage Electricity System within the premises, and with a duty under the HSW Act 1974 to prepare and issue a general policy statement on health and safety at work including the organisation and arrangements for carrying out that policy. This person should not be the authorising engineer.

2.13 Duty holder – the person on whom the Electricity at Work Regulations 1989 impose a duty in connection with safety.

2.14 Employer – any person or body who:

a. employs one or more individuals under a contract of employment or apprenticeship;

b. provides training under the schemes to which the Health and Safety (Training for Employment) Regulations 1988 (Statutory Instrument No 1988/1222) apply.

Northern Ireland: Health and Safety (Training for Employment) Regulations 1990, Statutory Instrument No 1990/1380

2.15 Authorising Engineer (high voltage) – a Chartered Electrical Engineer with appropriate experience, and possessing the necessary degree of independence from local management, who is appointed in writing by management to implement, administer and monitor the safety arrangements for the electrical supply and distribution systems of that organisation to ensure compliance with the Electricity at Work Regulations and to assess the suitability and appointment of candidates in writing to be Authorised Persons. (See HTM 2021 (in preparation).)

2.16 Authorising Engineer (low voltage) – a Chartered Engineer or Incorporated Electrical Engineer with appropriate experience, and possessing the necessary degree of independence from local management, who is appointed in writing by the management to implement, administer and monitor the safety arrangements for the low voltage electrical supply and distribution systems of that organisation to ensure compliance with the Electricity at Work Regulations and to assess the suitability and appointment of candidates in writing to be Authorised Persons. (See HTM 2020 (in preparation).)

2.17 Authorised Person – an individual possessing adequate technical knowledge and having received appropriate training, appointed in writing by the authorising engineer to be responsible for the practical implementation and operation of management's safety policy and procedures on defined electrical systems. (See HTM 2021 and HTM 2020 (in preparation).)

2.18 Competent Person – an individual who, in the opinion of an authorised person, has sufficient technical knowledge and experience to prevent danger while carrying out work on defined electrical systems. (See HTM 2021 and HTM 2020 (in preparation).)

Definitions

2.19 Injury – death or personal injury from electrical shock, electrical burn, electrical explosion or arcing, or from fire/explosion initiated by electrical energy.

2.20 System – a system in which all the electrical equipment is, or may be, electrically connected to a common source of electrical energy, including such source and such equipment.

2.21 Essential circuits – circuits forming part of the essential services electrical supply so arranged that they can be supplied separately from the remainder of the electrical installation.

2.22 Generator set – an engine-driven synchronous AC generator with exciter and other essential components to generate electrical power, that is it can be started and run independently of any external electrical supply.

2.23 Emergency lighting – BS5266 part 1:

a. a maintained lighting system is one in which all emergency lighting lamps are in operation at all material times;

b. a non-maintained lighting system is one in which all emergency lighting lamps are in operation only when the supply to the normal lighting fails;

c. a slave luminaire is one that is supplied from a central emergency power source and does not have its own internal secondary supply;

d. a sustained luminaire contains two lamp systems, one energised from the normal supply and the other from a central battery supply in an emergency;

e. escape lighting is that part of the emergency lighting system which is provided to ensure that escape routes are illuminated at all material times;

f. rest mode is defined in European Standards (when the building is completely evacuated) whereby the emergency lighting may be switched off either manually or from a central point when the normal supply is switched off.

2.24 Emergency supply – any form of electrical supply which is intended to be available in the event of a failure in the normal supply.

2.25 Essential service electrical supply – the supply from an engine-driven AC emergency generator which is arranged to come into operation in the event of a failure of the normal supply and provide sufficient electrical energy to ensure that all basic functions of the health care and personal social services premises are maintained in service.

2.26 No-break supply – a circuit continuously energised whether or not the normal supply is available.

2.27 Electrical equipment – includes anything used, intended to be used or installed for use, to generate, provide, transmit, transform, conduct, distribute, control, measure or use electrical energy.

3.0 Functional overview

Normal electricity supplies

3.1 The regional electricity companies have traditionally regarded hospitals and other health care and personal social services premises as priority users and given precedence to maintaining their supplies. However, failures will inevitably occur and experience indicates that the risk of failure is higher in rural districts, where there is wider use of overhead line distribution. The regional electricity company should be consulted to assess the extent to which the normal supply may be at risk from interruptions from various causes.

3.2 Large premises with over 300kW demand should be supplied by a high voltage feed (for example 11,000V) at three-phase to a sub-station located within the health care and personal social services premises. Smaller premises are normally supplied by a 415V, three-phase feed. High voltage supplies are more reliable.

3.3 Having two separate high voltage three-phase supply feeders is an additional safeguard for larger premises and is desirable. Whether this is possible largely depends on the local distribution system. The regional electricity company will advise.

3.4 The electrical installation within the health care and personal social services premises should be designed to limit interruptions in the supply due to internal faults as far as reasonably practicable. This is further detailed in HTM 2011, Emergency electrical services, 'Design considerations'.

The choice of segregated or unified systems

3.5 The rapid increase in demand for health care and personal social services premises offering advanced surgical and medical care has led to a proportionally increased demand for essential electrical services. When planning for new installations the option of segregated non-essential and essential electrical systems or a unified electrical system should be evaluated.

3.6 The provision of two segregated systems, each of smaller power capacity, must be balanced against having one larger unified power system in terms of economics and reliability in emergencies (see HTM 2011, Emergency electrical services, 'Design considerations').

3.7 Even when two segregated systems are provided it is desirable to incorporate emergency coupling between them. This allows the emergency generator to be connected to both systems if necessary, for example during a prolonged loss of power some non-essential services may become "essential" – such as catering and laundry. Also, with the coupling it is possible to provide a larger test load when required.

3.8 Where additional essential supply facilities are being added to existing installations the choice of distribution will depend on local conditions and the location of the existing essential supply relative to the electrical load centre in the health care and personal social services premises.

Selection of emergency supply equipment

3.9 Reliability in service is of prime importance for equipment used in essential supplies. Goods and services subject to the assessment and inspectorate services based on BS5750 (ISO 9000, EN 29000) – 'Quality Systems', and BS9000 – 'Electronic Components of Assessed Quality' or those equipment which carry the "CE" mark should be encouraged and supported.

3.10 The likely maximum demand from essential loads should be carefully analysed to ensure that the plant capacity is sufficient to supply the required loads in the event of a prolonged interruption to normal supplies.

3.11 Compliance of all electrical equipment with the appropriate British Standards or IEC, ISO harmonised or European Standards should be specified where they are applicable. Where no accepted standard or independent certification is offered, care should be taken with the manufacturer's specification to ensure that equipment will be satisfactory and reliable for the service required. IEC and ISO standards, by agreement, are harmonised and adopted by those EEC and EFTA countries represented on the European Committee for Electrotechnical Standardisation (CENELEC).

Uninterruptible power supplies

3.12 The considerable increase in sophistication and computerisation of equipment for specialised treatment and monitoring of patients has led to a greater demand for continuous and reliable power supplies. An alternating current (AC) "no break supply" that is continuous and unaffected by external circumstances can be provided by an uninterruptible power supply (UPS).

Combined heat and power systems

3.13 The basis of combined heat and power (CHP) systems is to obtain greater energy utilisation from the fuel used in an engine-driven generator set. The overall electrical efficiency of these sets is not usually more than 30%. However, a CHP system using a similar generator could achieve an overall electrical and thermal efficiency of up to 90% by utilising the previously wasted heat.

3.14 For greater benefit, the engine should run as continuously as possible at full load. It follows that for CHP to operate at maximum efficiency the engine must run at a high load factor with a simultaneous requirement for the heat output. To achieve this continuous running, additional generating plant may be required for essential emergency supply support during breakdown or maintenance.

3.15 Special arrangements must be made with the regional electricity company if it is intended to export any surplus electrical power.

4.0 Management action

4.1 Emergency power supplies should be periodically reassessed by the management and improved where necessary to ensure that they remain adequate to maintain essential clinical and surgical life-support facilities.

4.2 Where new health care and personal social services premises are built in separate phases the emergency power supply for the whole premises should, as far as possible, be planned and evaluated at the initial design stage. This will enable the total emergency power supply requirement to be assessed in the planning stages and appropriate areas of accommodation allocated. The required AC generator sets should be installed early in each phase to make the maximum amount of emergency power available as early as possible and so that staff training can be carried out.

4.3 Within this general guideline, the aim should be to keep electrical installations as simple as practicable.

4.4 When facilities do not currently meet the standards recommended in this Memorandum, management should bear in mind the following high priority objectives:

a. the protection of life-saving and life-support services such as those found in operating suites, delivery rooms, special care baby units, intensive therapy units and high dependency units where patient monitoring equipment, ventilators, defibrillators, renal dialysis machines, etc, are used;

b. the provision of light, heat and, if necessary, ventilation in patient areas;

c. essential supporting services;

d. safe evacuation of the building in an emergency.

4.5 The operational management to ensure generator availability is discussed in HTM 2011, Emergency electrical services, 'Operational Management'. Recommended procedures will ensure plant reliability and availability even though these tests will cause some minor disruption to hospital services. Simulation of loss of mains supply should be initiated once per month. This would allow staff, particularly in the ITU, to practise their emergency procedures.

Other publications in this series

(Given below are details of all Health Technical Memoranda available from HMSO. HTMs marked (*) are currently being revised, those marked (†) are out of print. Some HTMs in preparation at the time of publication of this HTM are also listed.)

1 Anti-static precautions: rubber, plastics and fabrics*†
2 Anti-static precautions: flooring in anaesthetising areas (and data processing rooms)*, 1977.
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17 Health building engineering installations: commissioning and associated activities, 1978.
18 Facsimile telegraphy: possible applications in DGHs†
19 Facsimile telegraphy: the transmission of pathology reports within a hospital – a case study†
20 Electrical safety code for low voltage systems (in preparation)
21 Electrical safety code for high voltage systems*†
22 Piped medical gases, medical compressed air and medical vacuum installations*†
22 Supp. Permit to work system: for piped medical gases etc†
23 Access and accommodation for engineering services†
24 –
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26 Commissioning of oil, gas and dual fired boilers: with notes on design, operation and maintenance†
27 Cold water supply storage and mains distribution* [Revised version will deal with water storage and distribution], 1978.
28 to 53 –

Component Data Base

54 User manual, 1989.
55 Windows, 1989.
56 Partitions, 1989.
57 Internal glazing, 1989.
58 Internal doorsets, 1989.
59 Ironmongery, 1989.
60 Ceilings, 1989.
61 Flooring, 1989.
62 Demountable storage systems, 1989.
63 Fitted storage systems, 1989.
64 Sanitary assemblies, 1989.
65 Signs†
66 Cubicle curtain track, 1989.
67 Laboratory fitting-out (in preparation)
68 Ducts and panels for sanitary assemblies (in preparation)
69 Protection (in preparation)
70 Fixings (in preparation)
71 to 80 –

Firecode

81 Firecode: fire precautions in new hospitals, 1987.
82 Firecode: alarm and detection systems, 1989.
83 Fire safety in health care premises: general fire precautions*†
84 Fire precautions in new residential care premises (in preparation)
85 [Revision to Home Office draft guidance in preparation]
86 Firecode: assessing fire risks in existing hospital wards, 1987
87 Firecode: textiles and furniture, 1987.
88 Fire safety in health care premises: guide to fire precautions in NHS housing in the community for mentally handicapped/ill people, 1986.

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Emergency electrical services
Management policy

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Northern Ireland

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